## ABSTRACT

A system and method for navigation utilizing sources of pulsed celestial radiation are provided. A spacecraft, satellite, or other vehicle (12) has a pulse sensor (22) mounted thereto for detecting signal pulses (14) generated by a plurality of pulsars or other celestial objects (16). The detected signal pulses (14) are synchronously averaged at the known period of the pulsar or other celestial object (16) with respect to a timer (24). Timer (24) measures the pulse time of arrival at the pulse sensor (22) by comparing the pulse signal (14) with a pulse shape template (52), and a processing means (30) calculates the offset time between the measured pulse time of arrival at sensor (22) with a calculated pulse time of arrival at the solar system barycenter (SSBC). The positions and pulse profile characteristics of the pulsars (16) are stored in a digital memory (34) and combining the calculated time offset with the known positions of pulsars (16), the navigational position, velocity, attitude and time of spacecraft (12) with respect to the SSBC can be calculated.